Finnish Maritime Administration

BULLETIN NO. 13/27.9.1999

ICE CLASS RULES 1985

The Finnish Maritime Administration has decided to add a new subparagraph to paragraph 3 of Annex I to its Ice Class Rules of 2 September 1985. Subparagraph 3.3 contains new requirements for engine output in the ice classes IA and IA Super from 1 January 2001.

The resolution will enter into force on 1 October 1999. Subparagraph 3.3 of Annex I is available only in English.

The Ice Class Rules 1985 have been published in FMA Bulletin 11/2.9.1985 and Annex III in Bulletin 2/27.1.1986. Amendments to the rules, made on 25 January 1988, 17 September 1992 and 31 January 1995 have been published in Bulletins 4/25.1.1988, 10/26.10.1992 and 6/1.2.1995 respectively.

A publication called The Ice Class Rules, 1985 is available in Finnish, Swedish and English and can be ordered from the FMA, Publications Sales. The price is FIM 31 (incl. VAT).

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FINNISH MARITIME ADMINISTRATION	**ORDER**	**Date: 7.9.1999** **No.: 7/30/99**

Contents:	New engine output requirements for Ice Classes IA and IA Super as from1.1.2001
Based on:	The Decree on Fairway Dues (1016/1983) 11 §
Target groups:	The maritime industry and the shipbuilding industry
Validity:	1.10.1999 – until further notice
Amends:	The Finnish National Board of Navigation's Resolution on Ice Class Rules, 1985 2.9.1985, No. 2575/85/307 New subparagraph 3.3 "Required engine output for ice classes IA and IA Super from 1.1.2001" added to Annex I, paragraph 3.

FINNISH MARITIME ADMINISTRATION
RESOLUTION
ON THE AMENDMENT OF ANNEX I TO THE FINNISH NATIONAL BOARD OF NAVIGATION'S RESOLUTION ON ICE CLASS RULES, 1985

Helsinki, 7 September 1999

The Finnish Maritime Administration has decided to
add a new subparagraph 3.3 to Annex I, paragraph 3 of the Finnish National Board of Navigation's Resolution on Ice Class Rules, issued on 2 September 1985, as follows:

This decision enters into force on 1 October 1999.
The new subparagraph 3.3 of Annex I, subparagraph 3 of the Ice Class Rules, 1985, has been notified in accordance with Directive 98/34/EC of the European Parliament and of the Council, as amended by Directive 98/48/EC.

Helsinki, 7 September 1999

Heikki Valkonen
Maritime Safety Director

Gunnar Edelmann
Head of Division

ANNEX I

REGULATIONS FOR STRENGTHENING AND DESIGN OF SHIPS FOR NAVIGATION IN ICE

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3. Engine output (new subparagraph 3.3 added by resolution 7.9.1999 No. 7/30/99)

3.3 Required engine output for ice classes IA and IA Super from 1.1.2001

3.3.1 Definitions

The dimensions of the ship, defined below, are measured on the maximum ice class draught of the ship as defined in paragraph 2.1.

L = length of the ship on the waterline [m]

L_{BOW} = length of the bow, fig. 5 [m]

L_{PAR} = length of the parallel midship body [m], fig. 5

B = maximum breadth of the ship [m]

T = maximum ice class draught of the ship [m] according to 2.1

A_{wf} = area of the waterline of the bow [m^2], fig. 5

α = the angle of the waterline at B/4 [deg], fig. 5

φ_1 = the rake of the stem at the centreline [deg], fig. 5

φ_2 = the rake of the bow at B/4 [deg], fig. 5

D_P = diameter of the propeller [m]

H_M = thickness of the brash ice in mid channel [m]

H_F = thickness of the brash ice layer displaced by the bow [m]

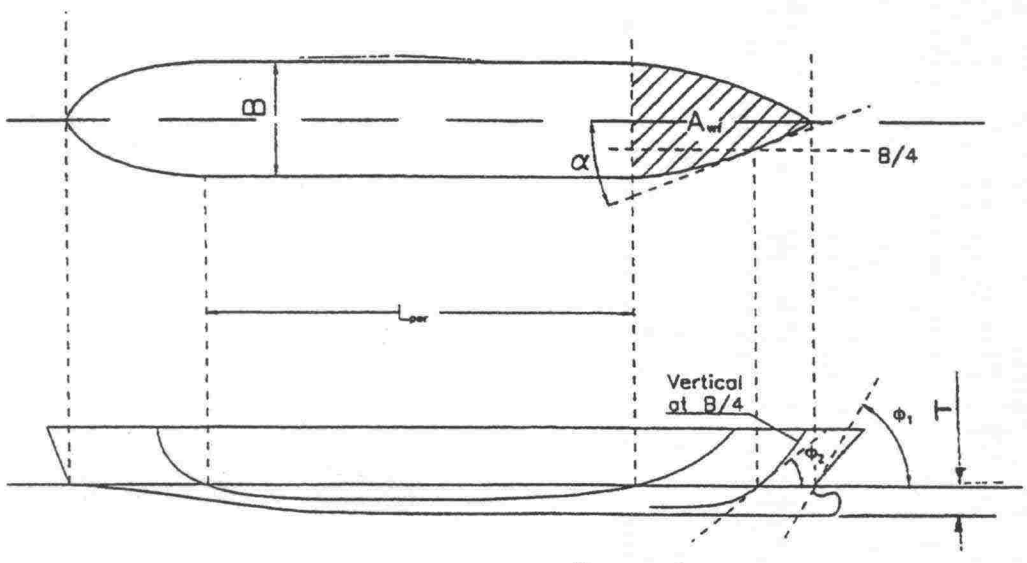

Figure 5

3.3.2 New Ships

To be entitled to ice class IA or IA Super, a ship the keel of which is laid or which is at a similar stage of construction on or after 1 January 2001 shall comply with the following requirements regarding its engine output.

$$P = K_e \frac{(R_{CH}/1000)^{3/2}}{D_P} [kW]; \text{ where:}$$

K_e shall be taken as follows:

Propeller type or machinery	CP or electric or hydraulic propulsion machinery	FP propeller
1 propeller	2,03	2,26
2 propellers	1,44	1,6
3 propellers	1,18	1,31

R_{CH} is the resistance of the ship in a channel with brash ice and a consolidated layer:

$$R_{CH} = C_1 + C_2 + C_3(H_F + H_M)^2\left(B + 1{,}85H_F - \frac{2H_F}{\tan\psi}\right)(0{,}15\cos\varphi_2 + \sin\psi\sin\alpha) + C_4 L_{PAR} H_F^2$$

$$+ C_5\left(\frac{LT}{B^2}\right)^3 \frac{A_{wf}}{L} [N]$$

$$H_F = 0{,}26 + (H_M B)^{0,5}$$

$H_M = 1{,}0$ for ice classes IA and IA Super

C_1 and C_2 take into account a consolidated upper layer of the brash ice and can be taken as zero for ice class IA.

For ice class IA Super:

$$C_1 = f_1 \frac{BL_{PAR}}{2\frac{T}{B}+1} + (1 + 0{,}021\varphi_1)(f_2 B + f_3 L_{BOW} + f_4 B L_{BOW})$$

$$C_2 = (1 + 0{,}063\varphi_1)(g_1 + g_2 B) + g_3\left(1 + 1{,}2\frac{T}{B}\right)\frac{B^2}{\sqrt{L}}$$

For a ship with a bulbous bow, φ_1 shall be taken as 90°.

$f_1 = 23$ N/m^2	$g_1 = 1530$ N
$f_2 = 45{,}8$ N/m	$g_2 = 170$ N/m
$f_3 = 14{,}7$ N/m	$g_3 = 400$ N/m^{1,5}
$f_4 = 29$ N/m^2	

$C_3 = 845$ kg/(m^{2}s^2)
$C_4 = 42$ kg/(m^{2}s^2)
$C_5 = 825$ kg/s^2

$$\psi = \arctan\left(\frac{\tan\varphi_2}{\sin\alpha}\right)$$

The following shall apply: $20 \geq \left(\frac{LT}{B^2}\right)^3 \geq 5$

3.3.3 Existing ships

To be entitled to ice class IA or IA Super a ship the keel of which is laid or which is at a similar stage of construction before 1 January 2001 shall comply with the requirements in section 3.3.2 above or the alternative requirements of this section by:

- 1 January 2005
- 1 January in the year when 20 years has elapsed since the year the ship was delivered, whichever occurs the latest.

When, for an existing ship, values for some of the hull parameters required for the calculating method in section 3.3.2 are difficult to obtain, the following alternative formulae can be used:

$$R_{CH} = C_1 + C_2 + C_3(H_F + H_M)^2(B + 0{,}658H_F) + C_4 L H_F^2 + C_5\left(\frac{LT}{B^2}\right)^3 \frac{B}{4}[N]$$

For ice class IA C_1 and C_2 can be taken as zero. For ice class IA Super, ship without bulb:

$$C_1 = f_1 \frac{BL}{2\frac{T}{B}+1} + 1{,}84(f_2 B + f_3 L + f_4 BL)$$

$$C_2 = 3{,}52(g_1 + g_2 B) + g_3\left(1 + 1{,}2\frac{T}{B}\right)\frac{B^2}{\sqrt{L}}$$

For ice class IA Super, ship with bulb, C_1 and C_2 shall be calculated as follows:

$$C_1 = f_1 \frac{BL}{2\frac{T}{B}+1} + 2{,}89(f_2 B + f_3 L + f_4 BL)$$

$$C_2 = 6{,}67(g_1 + g_2 B) + g_3\left(1 + 1{,}2\frac{T}{B}\right)\frac{B^2}{\sqrt{L}}$$

$f_1 = 10{,}3$ N/m^2	$g_1 = 1530$ N
$f_2 = 45{,}8$ N/m	$g_2 = 172$ N/m
$f_3 = 2{,}94$ N/m	$g_3 = 400$ N/m$^{1{,}5}$
$f_4 = 5{,}8$ N/m^2	

$C_3 = 460$ kg/(m^{2}s^2)
$C_4 = 18{,}7$ kg/(m^{2}s^2)
$C_5 = 825$ kg/s^2

The following shall apply: $20 \geq \left(\frac{LT}{B^2}\right)^3 \geq 5$

The Administration of Sweden and Finland may, however, grant an existing ship its original ice class even in case it does not comply with the requirements above, if it regularly has called at ports in the respective country in the winter season and on the condition that the experience of the performance of the ship in ice has been satisfying to the Administration in question.

3.3.4 Other methods of determining K_e or R_{CH}

The Administration may for an individual ship, in lieu of the K_e or R_{CH} values defined above, approve the use of K_e values based on more exact calculations or R_{CH} values based on model tests. Such an approval will be given on the understanding that it can be revoked if experience of the ship's performance in practice motivates this.